

Formulae, not on the formula sheet, that you need to know:

Area of a circle $Area = \pi r^2$

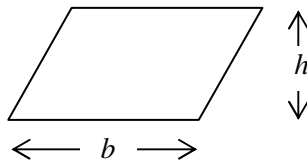
Circumference of a circle $C = 2\pi r$ or πd

Volume of a prism Cross section area \times height (or length) $= A \times l$

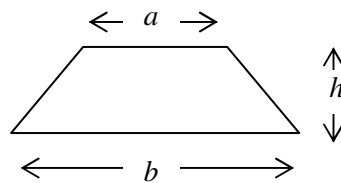
Volume of a cylinder $V = \pi r^2 h$

Curved surface area of a cylinder $A = 2\pi rh$

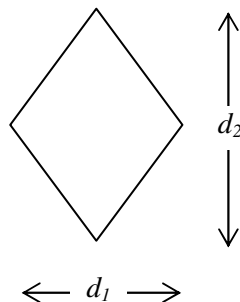
Area of parallelogram



Area Trapezium

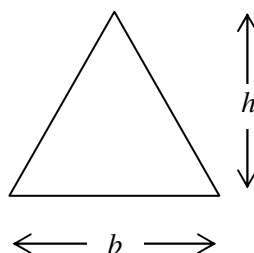


Area of rhombus or kite



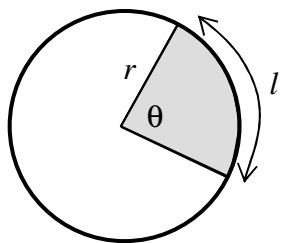
$$\frac{1}{2} \times \text{diag}_1 \times \text{diag}_2$$

Area of a triangle



$$A = \frac{1}{2}bh \quad (= \frac{1}{2} \text{ base} \times \text{height})$$

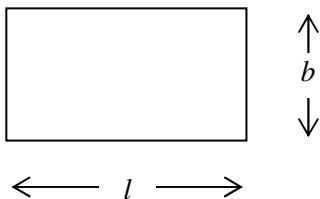
Sectors and arc lengths



Area of sector: $A = \frac{\theta}{360} \times \pi r^2$ or $\frac{\theta}{2\pi} \times \pi r^2$ (in radians)

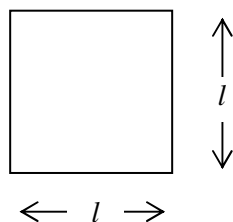
Arc length: $l = \frac{\theta}{360} \times \pi d$ or $\frac{\theta}{2\pi} \times \pi d$ (in radians)

Area of rectangle



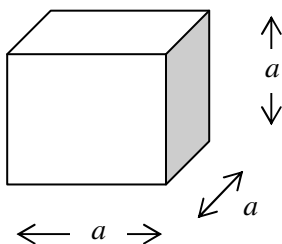
$A = l \times b$ (length \times breadth)

Area of square



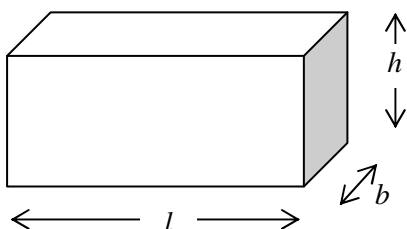
$A = l^2$

Volume of cube



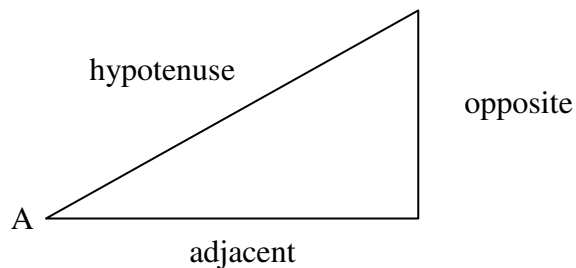
$V = a^3$

Volume of cuboid



$V = l \times b \times h$

Trigonometry



SOH – CAH - TOA

$$\sin A = \frac{\textit{opposite}}{\textit{hypotenuse}}$$

$$\cos A = \frac{\textit{adjacent}}{\textit{hypotenuse}}$$

$$\tan A = \frac{\textit{opposite}}{\textit{adjacent}}$$

Sine rule

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

Cosine rule

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$$

Area of a triangle

$$A = \frac{1}{2} ab \sin C$$

Related Angles

$$\sin(-A) = -\sin(A)$$

$$\cos(-A) = \cos A$$

$$\sin(90 - A) = \cos A$$

$$\cos(90 - A) = \sin A$$

$$\sin(180 - A) = \sin A$$

$$\cos(180 - A) = -\cos A$$

Sin-cos-tan formulae

$$\sin^2 A + \cos^2 A = 1$$

$$\frac{\sin A}{\cos A} = \tan A$$

Pythagoras Theorem

$$a^2 = b^2 + c^2$$

Algebra

The Quadratic formula
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Recurrence relation:
$$u_{n+1} = mu_n + c$$

Limit formula:
$$\text{if } |m| < 1 \quad (-1 < m < 1) \quad L = \frac{c}{1-m}$$

Rules of indices

$$a^m \times a^n = a^{m+n} \quad a^m \div a^n = a^{m-n} \quad (a^m)^n = a^{mn}$$

$$a^{-n} = \frac{1}{a^n} \quad a^{\frac{p}{q}} = \sqrt[q]{a^p} = \left(\sqrt[q]{a}\right)^p \quad a^{-\frac{p}{q}} = \frac{1}{\sqrt[q]{a^p}} = \frac{1}{\left(\sqrt[q]{a}\right)^p}$$

$$a^0 = 1 \quad a^1 = a$$

Rules of Surds

$$\sqrt{a} \times \sqrt{b} = \sqrt{ab} \quad \sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$$

Rules of Logarithms

$$y = \log_a x \quad \Leftrightarrow \quad x = a^y$$

Special Logarithms

$$\log_a a = 1 \quad \log_a 1 = 0$$

Percentage increase, decrease, change etc,

$$\% \text{ change} = \frac{\text{actual change}}{\text{original value}} \times 100$$

Straight Line formulae

Distance formula	$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$	(Pythagoras)
Mid-point formula	$= \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$	(simple average)
Gradient formula	$m = \frac{y_2 - y_1}{x_2 - x_1}$	(rise over run)
Equation of a line with gradient m passing through point (a, b)	$y - b = m(x - a)$	
Equation of a line in normal form: in which case, m is gradient and c is the y -intercept	$y = mx + c$	
Equation of a line with integer coefficients.	$ax + by + c = 0$	
Product of gradients of perpendicular lines:	$m_1 \times m_2 = -1$	
Gradient of a line perpendicular to a line of gradient m	$\text{gradient} = -\frac{1}{m}$	
Angle θ between a line of gradient m and the positive direction of the x -axis is related:	$m = \tan \theta$ $\theta = \tan^{-1}(m)$	
Equation of line parallel to x -axis passing through $(0, k)$	$y = k$	
Equation of line parallel to y -axis passing through $(k, 0)$	$x = k$	

Calculus

Differentiation

$$f(x) = x^n$$

$$f'(x) = nx^{n-1}$$

$$f(x) = kx$$

$$f'(x) = k$$

$$f(x) = k$$

$$f'(x) = 0$$

Integration

$$f'(x) = x^n$$

$$f(x) = \frac{x^{n+1}}{n+1}$$

$$f'(x) = kx$$

$$f(x) = \frac{kx^2}{2}$$

$$f'(x) = k$$

$$f(x) = kx$$

Area between a curve $y = f(x)$,
the lines $x = a$, $x = b$ and the x -axis

$$A = \int_a^b f(x) dx = [F(x)]_a^b = F(b) - F(a) \quad \text{where } F'(x) = f(x)$$

Area between the curves $y = f(x)$ and $y = g(x)$, where $y = g(x)$ is the top curve on the graph.

$$A = \int_a^b g(x) - f(x) dx$$

where a and b are the x -coordinates of the points of intersection of $y = f(x)$ and $y = g(x)$